No. 609,314. Patented Aug. 16, 1898.

J. B. WESTHAVER.

BICYCLE GEARING.

(Application filed Oct. 8, 1897.)

(No Model.)

Fig. 1.

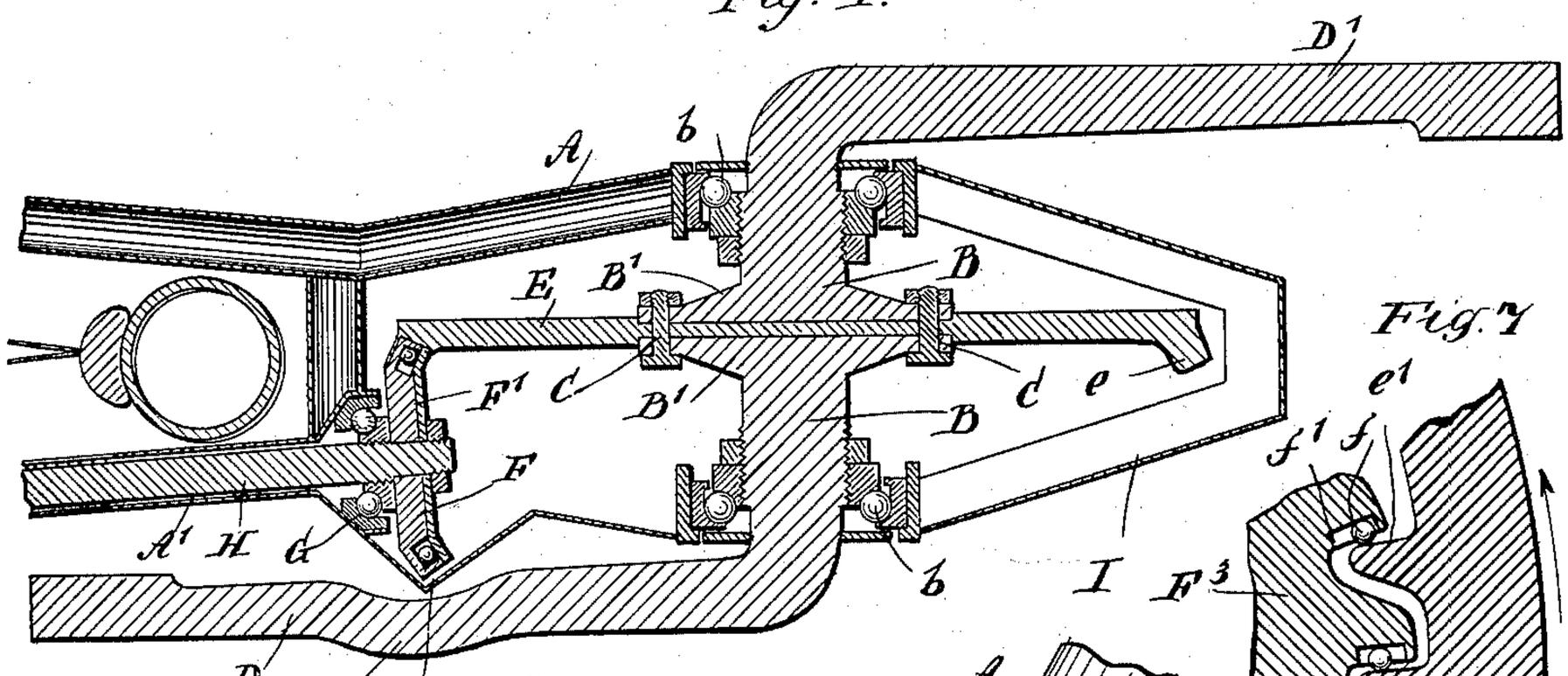


Fig. 7.

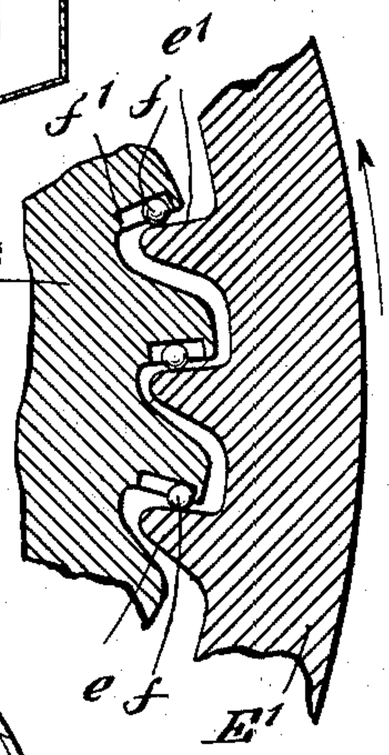


Fig. 2.

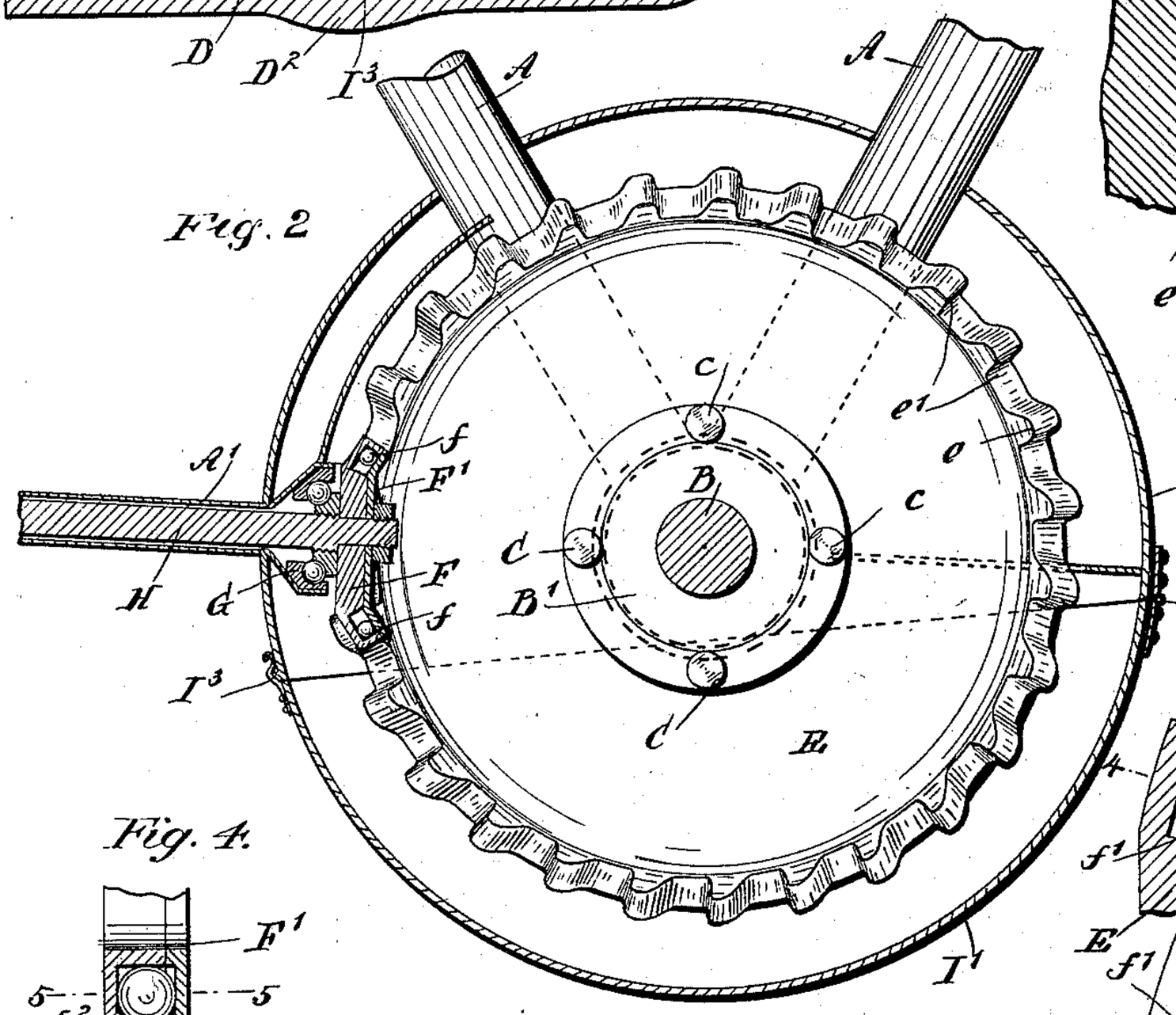


Fig. 4.

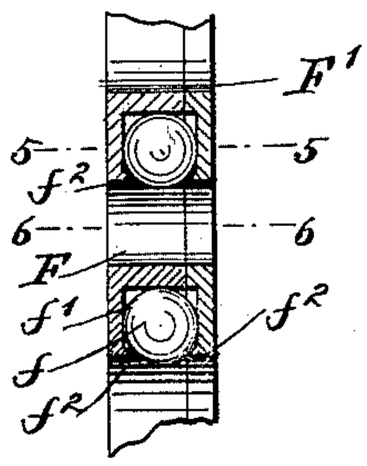


Fig. 3.

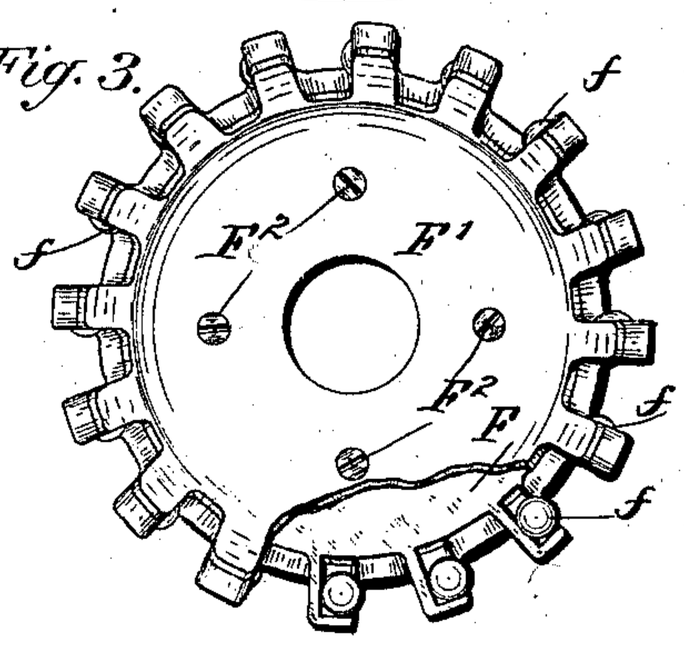


Fig. 5.

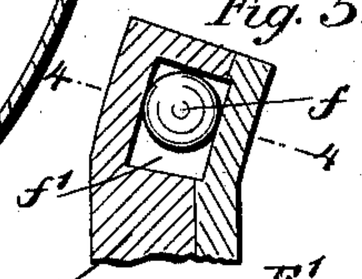
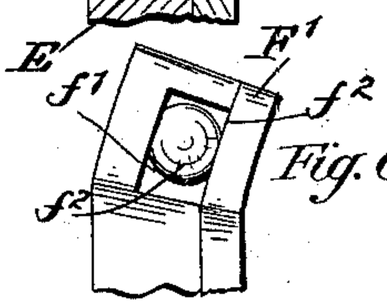


Fig. 6.



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UNITED STATES PATENT OFFICE.

JAMES B. WESTHAVER, OF EDGEWATER, COLORADO.

BICYCLE-GEARING.

SPECIFICATION forming part of Letters Patent No. 609,314, dated August 16, 1898.

Application filed October 8, 1897. Serial No. 654,500. (No model.)

To all whom it may concern:

Be it known that I, JAMES B. WESTHAVER, of Edgewater, in the county of Jefferson, State of Colorado, have invented a new and Improved Bicycle-Gearing, of which the following is a full, clear, and exact description.

My invention relates to the driving mechanism of bicycles, and particularly to bevel-geared mechanism for communicating the power from the crank-shaft to the driving-wheel.

The objects and novel features of the invention will be fully described hereinafter, and the scope of the patent will be indicated in the appended claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a horizontal section taken through the crank-shaft and the driving mechanism immediately connected therewith. Fig. 2 is an elevation, partially in section, of the same mechanism. Fig. 3 is a front elevation of the gear-wheel containing the balls in the teeth thereof. Fig. 4 is a section taken through two adjacent teeth of the said wheel and on line 4 4 in Fig. 5. Figs. 5 and 6 are a section and an elevation, respectively, of a single tube, the views being taken upon the lines 5 5 and 6 6 in Fig. 4; and Fig. 7 is a sectional view showing the two gear-wheels having the ball-bearings between their teeth, said gear-wheels being shown as of a different construction from those shown in the other drawings, as their peculiar construction may be better illustrated thereby.

My improved form of gear-wheel is shown herein as applied to the driving mechanism of a bicycle, as, although it will be evident it may be used for other purposes, it lends itself readily to such mechanism as a bicycle, where it is desirable that the friction be reduced to as low a point as possible.

In constructing my bicycle the cranks D and D′ are each formed integral with the corresponding half of the crank-shaft B. The inner end of each half of the crank-shaft is provided with a flange B′, which, as shown in the drawings, is circular in outline. Between these flanges is inserted the main driving-gear E, which is shown as provided with circular recesses centrally located upon each face thereof and receiving the flanges B′ of the crank-shaft. These flanges and the gear-wheel E are firmly secured together by means of bolts C through the same. The crank-shaft is provided with ball-bearings *b* of any suitable or convenient construction. The framing A of the machine, excepting in parts which will be described hereinafter, is of the usual construction.

One of the lower rear braces A′ is used as a receptacle for the power-transmitting shaft H. The forward end of this shaft is provided with a bevel-gear F, meshing with the bevel-gear E, mounted upon the crank-shaft. The rear end of the shaft H is connected with the driving-wheel of the bicycle in the manner usual with bevel-gear-driven bicycles. It is of course intended to use my form of gear-wheel illustrated herein for such connection. This connection, however, has not been illustrated, as there is nothing novel therein excepting the application of the ball-bearing between the teeth of the wheels, the latter being illustrated in the drawings accompanying this.

One face or flank of the teeth upon the bevel-gear E is formed substantially radial. This flank is indicated by the letter *e′*. The remainder of the tooth *e* may be formed of any suitable shape.

The gear F is formed in two parts—namely, the body F and a plate F′. The teeth which are formed in this gear also have one flank extending in a substantially radial direction.

In this face of each tooth is formed a radially-extending slot *f′*. The main part of this slot is in the body F. This portion of the slot opens toward the flank of the tooth and toward one side. This side of the slot is closed by the part of the tooth which is formed upon the plate F′, as clearly indicated in Figs. 3 and 4. The outer side edges of the walls of the slot are provided with inwardly-extending flanges f^2, which narrow the slot so that the ball *f*, which is inserted therein, cannot fall out. The slot is longer than the diameter of the ball, thus permitting the ball to roll therein in a radial direction.

The operation of the ball may be seen more clearly by referring to Fig. 7, in which it is shown as applied to two spur-gears E′. In

this case one of the gears is shown as being internally toothed. The operation is, however, the same whether the gear is an internal-toothed or an external-toothed wheel. By reason of the centrifugal force generated in revolving the wheel F^3 the ball *f* will be thrown to the outer end of the slot *f'*. It will thus be brought into contact with the face *e'* of the tooth *e* while near the outer ends of its slot. As the teeth upon the two wheels mesh more deeply the ball *f* will be rotated between the surfaces of the teeth, so that it will be brought nearer the inner end of the slot *f'*. The extreme inner position of the ball in the slot will occur when the tooth is upon the center line of the two wheels. From this point to the point of disengagement of the teeth the rotation of the ball will carry it toward the outer end of the slot. By reason of this construction the contact between the gear-teeth is a true rolling contact without any sliding motion, and consequently the friction is greatly reduced if not entirely done away with. This form of gear-teeth is well adapted for use in connection with bicycles and other mechanism in which it is desirable to do away with all of the friction possible.

The gears surrounding the crank-shaft are inclosed by a casing I. The lower half I' of this casing is separable from the remainder, being engaged at I^2 to one side thereof and at its opposite side secured thereto by a spring-catch I^3. It may thus be readily disengaged, so as to give access to the gears for cleaning and assembling the parts.

The power-transmitting shaft H is mounted in suitable ball-bearings G at each end thereof. The crank D, which is on that side of the machine containing the gear-wheel F and shaft H, is curved outwardly, as shown at D^2, so that it will clear the casing and wheel F. This enables the body of the crank and the foot in pedaling to be kept near the center of the bicycle and yet to use a bevel-gear of suitable size.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A gear-wheel, comprising a body having teeth provided with approximately radial slots open toward the adjacent tooth and also open at one face of said body, a plate secured upon the said face of the body and provided with teeth covering one open side of each slot, said teeth having inwardly-projecting edges at the slots, a cross projection or stop at the outer end of each slot, and balls held in said slots.

2. A gear-wheel having a central portion of reduced thickness forming shoulders at its junction with the marginal portion of the wheel, a crank-shaft made in two sections, each provided at its inner end with an enlargement or flange-plate seated in the reduced central portion of the wheel and against the shoulders thereof, and means for connecting the shaft-sections and wheel.

JAMES B. WESTHAVER.

Witnesses:
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WM. A. BURKE.